Summary of "The Association of Continuity of Care With Emergency Department Visits and Hospitalizations For Patients With Asthma"

By M. Cree, N. Bell, D. Johnson and K.C. Carrière

Purpose

Continuity of care is considered an essential component of a high quality health care system and is a core element of primary care. This study determined the association between continuity of care and health service utilisation (emergency room visits and hospitalizations) in those patients with asthma.

Approach

The focus of this study was the Palliser Health Region with a population of 88,000 living in both urban and rural settings. Patients studied had two or more physician office visits for asthma between April 1, 1996 to March 31, 2000, were between the ages of five and forty-five years and lived in the health region for two consecutive years.

Key findings

Of the 87,928 people who resided in the Palliser Health Region at the beginning of the study, 3,853 (4.4 percent) were identified as having had two or more asthma visits. The following are the key findings of this study:

- The average number of emergency room visits in those identified for asthma was 2.25 during the study period and hospitalisations occurred in 212 (7.6 percent).
- Types of physicians providing visits included family physicians and general practitioners (seventy-five percent), paediatricians (fifteen percent), and internists (ten percent).
- High continuity of care was associated with sixty percent to seventy-five percent reduction in emergency room visits and approximately twenty-five percent in hospitalizations among patients with asthma.
- The study also found that few patients attended their physicians either before (seventeen percent) or after (thirty-eight percent) emergency room visits for asthma suggesting that existing patterns of care and organizational structures detract from continuity of care.

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Conclusions

The study results support the importance of continuity of care as a key factor in the management of patients with asthma. The results also support existing evidence that continuity of care would be an essential component of health care systems that manage chronic diseases like asthma.

Organizational or financial changes to existing health care systems should be undertaken with an understanding of the potential importance of continuity of care on the health care utilization and health outcome patterns of these systems.

For more information

Copies of the report are available from the

Alberta Centre for Health Services Utilization Research

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The Association of Continuity of Care With Emergency Department Visits and Hospitalizations For Patients With Asthma

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SUMMARY

Continuity of care is considered an essential component of a high quality health care system and is a core element of primary care. We determined the association between continuity of care and health service utilization (emergency room visits and hospitalizations). We chose to study the Palliser Health Region with a population of 88,000 living in both urban and rural settings. Patients studied had two or more physician office visits for asthma between April 1, 1996 to March 31, 2000, were between ages five to forty-five, and lived in the health region for two consecutive years. This study found that high continuity of care was associated with sixty percent to seventy-five percent reduction in emergency room visits and approximately twenty-five percent reduction in hospitalizations among patients with asthma. Continuity of care is an important factor in the management of patients with asthma. Organizational innovations to health care systems should consider the importance of continuity of care on health care utilization and health outcomes.

INTRODUCTION

Continuity of care has been considered an essential component of a high quality health care system and a core element of primary care [1-3]. It has been found to be associated with increased patient satisfaction [4], improved heath care outcomes that include fewer hospitalizations and emergency room visits [4-8], reduced overall health care costs [9, 10], and improved patient health behaviours [11]. Continuity of care has also been associated with improved outcomes for chronic health conditions that include diabetes [12, 13] and chronic mental illness [14]. In spite of the perceived benefits of continuity of care, changes in the financing and organization of heath care in Europe and North America have created a threat to continuity of care [15, 16].

Asthma is a chronic disease that continues to have considerable impact on the morbidity, mortality and health care costs in the United States and other developed countries in spite of major advances in the diagnosis and management [17]. The overall direct costs for asthma were estimated at $12.7 billion in the United States in 1998 [18] and over $1.3 billion in Canada in 1993 [19] with a similar economic burden in other developed countries [20]. In the United States between 1980 and 1994, there was a seventy-five percent increase in asthma prevalence for all ages [21] while the age-adjusted mortality increased seventy-one percent between 1995 and 1996 [22]. Although continuity of care has been identified as an important factor in the management of patients with asthma [23], there is relatively little information on the influence of continuity of care on the health care outcomes of patients with asthma.

We undertook this study to determine the association between continuity of care and emergency room and hospital utilization in patients with asthma. In addition, we also examined the association of other patient and physician practice characteristics with these health care outcomes for patients with asthma.

METHODS

Study Design and Patient Selection:

This is a population-based cohort study of patients with asthma from the Palliser Health Region in Alberta, Canada. For inclusion in the study, each patient must have had two or more office visits for asthma during the four-year study period between April 1, 1996 to March 31, 2000, be between ages five to forty-five at

the time of first diagnosis and have lived in the Palliser Health Region for at least two consecutive years during the study period.

The Palliser Health Region is one of the seventeen health regions in the province of Alberta with a population of approximately 88,000. This region includes an urban regional health centre (Medicine Hat population is about 57,000) and several smaller towns and villages located within its 13,000 square miles. This region is representative of the patient demographic and health care system characteristics of the province of Alberta.

Demographic and patient data was obtained from the medical record registries maintained by Alberta Health and Wellness. All residents in the province of Alberta are enrolled in a single payer publicly funded health care insurance plan administered by Alberta Health and Wellness that provides universal health coverage to all provincial residents. For reimbursement of services provided to their patients, all physicians must have submitted a claim to Alberta Health and Wellness. Asthma was defined using the *International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM)* [24] code 493.x. An asthma office visit was defined as one claim for a consultative visit per physician per day using the *Canadian Classification of Diagnostic, Therapeutic and Surgical Procedures* [25] (codes 03.x, 13.4x or 98.8x). The Alberta Population Patient Registry provided patient demographic characteristics that included age, sex, income, area of residence, and aboriginal status. For each patient, the Claims Assessment System provided the total number of asthma visits, total number of physician visits, the most frequently visited physician, and the site of the visits. For each visit, the claim submission included the type, date, location of services rendered, physician specialty and ICD-9-CM diagnostic code. Data on hospitalizations for asthma (most responsible diagnosis ICD-9-CM 493.x) was obtained from the Alberta Hospital Abstract database. We determined the length of hospital stay, use of mechanical ventilation (ICD-9-CM code 96.72), respiratory failure (ICD-9-CM codes 518.81, 799.1), admission to special care units (hospital defined), and in-hospital death. Data for emergency department visits for asthma was obtained from two databases. All visits for 1996/1997 and partial information for the following years was captured in the Claims Assessment System. The remaining data for 1997/1998 onwards was recorded in the Alberta Ambulatory Care Classification System. Data was extracted from both sources and merged together to produce a complete history of emergency department visits. Physician characteristics included gender, year of graduation, average number of patients seen per day and annual fee for service income. The physician practice location was obtained from the Physician Stakeholder Database.

Continuity of care was calculated using data obtained from the physician claims registry based on the Usual Provider of Care [26] index. The index represents the

proportion of the patient's total physician visits that were made to the most frequently visited physician or the number of visits to the patient's most frequently visited physician divided by the total number of physician visits. Consequently, Usual Provider of Care will be greater than zero and at most one (high) when all physician visits are made to the same physician. Continuity of care was also assessed by an alternative method, Sequential Continuity Measure [27], that had a moderately strong correlation of 0.65 with the Usual Provider of Care index.

STATISTICAL ANALYSIS

Logistic regression was used to examine the association between the physician/patient characteristics and the dependent variables: being hospitalized or not and visiting the emergency room or not. Multiple linear regression was used to describe the relationship between the length of hospital stay and the physician/patient characteristics. Because the number of days spent in the hospital was skewed to the right, we used the log transformation of the length of stay as the dependent variable. Poisson regression was used to investigate the association of the physician/patient characteristics and the two dependent variables: number of hospitalizations and number of emergency room visits.

The input variables were categorized to assist interpretation. Age was divided into four groups: "5-12", "13-20", "21-30", or "31-45"; residence was divided into Medicine Hat (urban) or rural; subsidized income was defined as "none" or "some"; number of asthma visits was dichotomised into "four or less" or "five or more"; continuity of care was categorized according to its average value as: high (Usual Provider of Care > 0.69) or low. The characteristics of the patient's most frequently visited physician were also categorized as follows: year of graduation was separated into three groups: "1974 or earlier", "1975 to 1989" or "1990 or later"; total payments received in Canadian dollars as "less than full time equivalent general practitioner ($150,000) "average to high" ($150,000 to $272,000), or "highest" (> $272,000); and average number of patients seen daily as "< 24", "25-29", "30-34","35-39", or "40 or more". All analysis was done using the SAS statistical package (version 7, SAS Institute Inc., Cary, NC, 1998).

All data analyses were undertaken within the protected environment of Alberta Health and Wellness under provincial legislative guidelines on the confidentiality of health information.

RESULTS

Of the 87,928 people who resided in the Palliser Health Region at the beginning of the study, 3,853 (4.4 percent of the population) were identified who had two or more asthma visits during the four-year study period. This is similar to the

prevalence of asthma diagnosed by physicians in the adjacent province of Saskatchewan [28]. From these, a study cohort of 2,774 (3.2 percent of the population) patients was identified who were between ages five and forty-five at the beginning of the study and had resided within the study region continuously for two years.

The characteristics of the study patients are shown in Table 1. These patients made 13,302 office visits for asthma to 547 physicians in Alberta during the study period. They averaged 4.8 visits for asthma while three patients made over fifty office visits for asthma. Of the total visits, 11,467 (eighty-six percent) were made within the Palliser Health Region. The remaining visits were distributed either in the adjacent metropolitan centres with 864 (6.5 percent) in Calgary and 580 (4.4 percent) in Lethbridge or with 391 (3.4 percent) throughout the other regions of Alberta.

During the four-year study period, 950 (thirty-four percent) of the study patients made 2,140 emergency room visits. The average number of emergency room visits was 2.25 with a range from one to eighty-eight (one patient). Six or less emergency visits were made by 888 (ninety-five percent) of patients. Office visits for asthma were made by (seventeen percent) of patients in the week prior to the emergency room visit and (thirty-eight percent) in the week after the emergency room visit.

Hospitalizations occurred in 212 (7.6 percent) of study patients with fifty (1.8 percent) having two or more hospitalizations. Hospital-based adverse asthma outcomes were infrequent among these patients. None of the patients died in the hospital, one patient required mechanical ventilation, two suffered respiratory failure, and six were admitted to special care units in the hospital.

The physician demographic characteristics are shown in Table 2. Of the 547 physicians who provided care to these patients, seventy-four (fourteen percent) provided the majority of their asthma services in the Palliser Health Region. A total of twenty (twenty-seven percent) of the seventy-four physicians provided asthma services in at least ten months of each study year and provided at least fifty office asthma visits in the Palliser Health Region in each of the four years of the study period. Types of physicians providing visits included family physicians/general practitioners (seventy-five percent), paediatricians (fifteen percent), and internists (ten percent).

The risk factors associated with hospitalization are shown in Table 3. High continuity of care was associated with a lower number of hospitalizations (Odds Ratio = 0.69; 95 % CI: 0.54 to 0.89) and total days in hospital (Relative Risk = 0.77; 95 % CI: 0.63 to 0.95). Average number of patients seen daily was also negatively associated with the risk of hospitalization; the risk of

hospitalization was lower as the average number of patients seen by the physician increases. Also associated positively with risk for total days in hospital was patient age; total hospital days tended to be longer as patients age. High (five or more) number of office visits for asthma was associated with increased risk of hospitalization while high number of office visits, urban residence and high average number of patients seen per day tended to be associated with increased risk for total days in hospital. The length of the hospital stay was reduced by about twenty-five percent in those with high compared to low continuity of care.

The risk factors associated with emergency visits are shown in Table 4. High continuity of care was associated with a low risk of an emergency visit (OR=0.24; 95% CI: 0.19 to 0.29) and decreased number of emergency visits (OR= 0.38; 95% CI:0.33 to 0.43). Other factors associated with a decreased risk of an emergency visit included, female physician, average to high physician income and rural residence. Factors associated with an increased risk of an emergency visit included advancing patient age, high (five or more) asthma office visits and low number of average patients seen daily. Other factors negatively associated with the number of emergency visits were patient age, physician year of graduation, physicians income, average number of patients seen daily and rural patient residence. Risk factors positively associated with the number of emergency visits included high (five or more) office visits for asthma and female physician.

DISCUSSION

This study found that high continuity of care was associated with sixty percent to seventy-five percent reduction in emergency room visits and approximately twenty-five percent in hospitalizations among patients with asthma.

These results support the findings of previous studies that have shown increased continuity of care is associated with improved health outcomes in other chronic diseases such as diabetes [12, 13] and mental health [14] disorders while decreased continuity of care was associated with increased emergency department and hospital utilization [6, 7]. The importance of continuity of care for patients with asthma is further supported by a study undertaken by Sin et al [29] that found for patients with asthma attending emergency departments, follow-up office visits reduced subsequent relapse visits to emergency departments. These results suggest that provider continuity of care is an important factor in the effective management of asthma.

The study also examined other patient and physician factors associated with emergency room and hospital utilization for asthma patients. Patients with a high number of office visits were at a higher risk for hospitalization and emergency

visits. These patients may have had an increased severity of illness, increased difficulty in managing their disease or poorer compliance. The study also found that few patients attended their physicians either before or after emergency room visits for asthma suggesting that existing patterns of care and organizational structures detract from continuity of care. Approaches that enhance the continuity of care in these patients might reduce the reliance of these patients for care in either emergency departments or hospitals. Physician characteristics such as sex, year of graduation, and income level that were associated with emergency visits but not hospitalization suggest practice style effects some but not all types of utilization.

The study results may also have implications for the development of policy on the organization and management of primary health care. In the United States [15, 30], the Britain [16, 31] and other developed countries changes in the organization and financing of health care during the last decade have resulted in approaches that threaten the development and maintenance of continuity of care [15, 16, 30, 31]. These changes have included fragmentation of care both between the hospital and community and within community settings. Because of the association of high continuity of care with improved health outcomes and decreased health care utilization, changes or reforms to primary health care should be undertaken with the recognition of the importance of continuity of care. Organizational or financial changes that have the unintended effect of decreasing continuity of care could potentially result in increased utilization in high cost areas of the health care system such as emergency departments and hospitals and result in increased health care costs. Areas where the consideration of continuity of care would be important include methods of physician payment and the care delivery models.

There are some limitations to the study. First, the findings of the study may have been influenced by unknown differences in the characteristics of the patients associated with continuity of care. Patients with high continuity of care may be more motivated to seek preventive and follow-up care with their physicians for their asthma or there may be a difference in the severity of disease in patients associated with continuity of care. Second, although the Palliser Health Region has similar demographic and health care organizational characteristics to the rest of the province of Alberta, there may be other unidentified differences in patient or practice characteristics that could influence the study outcomes. Finally, the results of the study may not be generalizable to remote rural areas or areas surrounding larger population centres because of the proximity of metropolitan centres and travel distances are not uniformly distributed throughout Alberta.

Nonetheless, the study results supports the importance of continuity of care as a key factor in the management of patients with asthma. The results also support existing evidence that continuity of care would be an essential component of health care systems that manage chronic diseases like asthma. Organizational

or financial changes to existing health care systems should be undertaken with an understanding of the potential importance of continuity of care on the health care utilization and health outcome patterns of these systems.

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Table 1 – Characteristics of Asthma Patients

Patient characteristic	Patients (n=2,774)	High Continuity [1] (n=1,209)	Low Continuity (n=1,565)
	Number (%)		
Age (years)			
5-12	998 (36)	483 (40)	515 (33)
13-20	670 (24)	252 (21)	418 (27)
21-30	490 (18)	163 (13)	327 (21)
31-45	616 (22)	311 (26)	305 (19)
Gender			
Female	1,340 (48)	562 (46)	778 (50)
Male	1,434 (52)	647 (54)	787 (50)
Residence			
Urban	1,548 (56)	688 (57)	860 (55)
Rural	1,226 (44)	521 (43)	705 (45)
Subsidized Income	434 (16)	186 (15)	248 (16)
Aboriginal	21 (< 1)	7 (< 1)	14 (< 1)
Number of asthma visits			
Low (2)	1,068 (39)	531 (44)	537 (34)
Medium (3-4)	903 (33)	389 (32)	514 (33)
High (5 or more)	803 (29)	289 (24)	514 (33)
Days in hospital			
0	2,562 (92)	1,133 (94)	1,429 (91)
1	42 (2)	20 (2)	22 (1)
2	56 (2)	25 (2)	31 (2)
3 or 4	56 (2)	18 (1)	38 (2)
5 or more	58 (2)	13 (1)	45 (3)
Total hospital admissions			
0	2,562 (92)	1,133 (94)	1,429 (91)
1	162 (6)	65 (5)	97 (6)
2 or more	50 (2)	11 (1)	39 (2)
Total hospital admissions to regional hospital			
0	2,625 (95)	1,151 (95)	1,474 (94)
1	121 (4)	53 (4)	68 (4)
2 or more	28 (1)	5 (1)	23 (1)
Emergency room visits			
0	1,824 (66)	1,006 (83)	818 (52)
1	518 (19)	119 (10)	399 (25)
2 or 3	298 (11)	66 (5)	232 (15)
3 or more	134 (5)	18 (1)	116 (7)

[1] High continuity (Usual Provider of Care > 0.69)

Table 2 – Characteristics of Physicians in the Palliser Health Region Providing Care to Asthma Patients

Physician characteristics	Patients (n=2,774)	High continuity [1] (n=1,209)	Low continuity (n=1,565)
	Number (%)		
Year of graduation			
1974 and earlier	725 (26)	329 (27)	396 (25)
1975 to 1989	1,609 (58)	703 (58)	906 (58)
1990 and later	437 (16)	177 (15)	260 (17)
Gender			
Male	2,379 (86)	1,069 (88)	1,310 (84)
Female	393 (14)	140 (12)	253 (16)
Physician income [2]			
Less than average	595 (21)	169 (14)	426 (27)
Average to high	1,072 (39)	504 (42)	568 (36)
Very high	1,021 (37)	519 (43)	502 (32)
Average number of patients seen daily			
≤ 24	639 (23)	281 (23)	358 (23)
25-29	978 (35)	418 (35)	560 (36)
30-34	440 (16)	188 (16)	252 (16)
35-39	463 (17)	210 (17)	253 (16)
40 or more	252 (9)	112 (9)	140 (9)

[1] High continuity (Usual Provider of Care > 0.69)

[2] 1998/99 Canadian dollars - less than average < $150,000; average to high $150,000 to $272,000; very high > $272,000

Table 3 – Risk Factors Associated With Hospitalization

Characteristic	Total Days in Hospital * Relative Risk (95 % confidence interval)	Number of Hospitalizations Odds Ratio (95 % confidence interval)	Hospitalized or not Odds Ratio (95 % confidence interval)
Patient age			
5-12	0.70 (0.54-0.90) †		
13-20	0.83 (0.63-1.09)	N.S. ‡	N.S. ‡
21-30	0.83 (0.61-1.14)		
30-45	1.00		
Number of asthma office visits			
Low (2-4)	1.00	1.00	1.00
High (5 or more)	1.42 (1.12-1.79) †	12.18 (8.93-16.60) †	10.81 (7.71-15.16) †
Average number of patients seen daily			
≤ 24	1.00	1.00	1.00
25-29	0.82 (0.65-1.05)	1.05 (0.79-1.40)	1.49 (1.01-2.19) †
30-34	0.88 (0.64-1.20)	0.71 (0.48-1.04)	0.93 (0.57-1.52)
35-39	1.73 (1.20-2.50) †	0.63 (0.43-0.92) †	0.43 (0.24-0.74) †
40 or more	0.76 (0.55-1.05)	0.61 (0.41-0.93) †	0.84 (0.51-1.40)
Residence			
Rural	1.00	N.S. ‡	N.S. ‡
Urban	1.25 (1.03-1.51) †		
Continuity of care			
Low (UPC ≤ 0.69) ¹	1.00	1.00	N.S. ‡
High (UPC > 0.69) ¹	0.77 (0.63-0.95) †	0.69 (0.54-0.89) †	

* Patients included if they had at least one hospital admission
† $P \leq 0.05$
‡ Characteristics were not significant in the initial model and were removed in the final model
¹ Where UPC stands for Usual Provider of Care

Table 4 – Risk Factors Associated With Emergency Visits

Characteristic	Number of Emergency Visits Odds Ratio (95% confidence interval)	Emergency Visit or Not Odds Ratio (95% confidence interval)
Patient age		
5-12	0.84 (0.72-0.97) *	1.24 (0.95-1.61)
13-20	1.08 (0.93-1.25)	1.39 (1.05-1.83) *
21-30	1.09 (0.93-1.27)	1.72 (1.29-2.30) *
30-45	1.00	1.00
Patient sex		
Male	1.00	N.S. †
Female	1.17 (1.06-1.31) *	
Subsidized income	N.S. †	1.37 (1.07-1.76) *
Number of asthma office visits		
Low (2-4)	1.00	1.00
High (5 or more)	4.30 (3.85-4.80) *	4.70 (3.85-5.73) *
Physician sex		
Male	1.00	1.00
Female	1.30 (1.13-1.50) *	0.62 (0.47-0.82) *
Physician year of graduation		
1974 and earlier	1.00	
1976 to 1989	0.95 (0.83-1.08)	N.S. †
1990 and after	0.77 (0.63-0.94) *	
Physician income		
< Average	1.00	1.00
Average to high	0.58 (0.50-0.68) *	0.29 (0.22-0.38) *
Very high	0.59 (0.49-0.74) *	0.32 (0.24-0.43) *
Average number of patients seen daily		
≤ 24	1.00	1.00
25-29	1.64 (1.41-1.91) *	2.51 (1.92-3.27) *
30-34	1.45 (1.17-1.80) *	1.91 (1.36-2.68) *
35-39	1.09 (0.88-1.34)	1.04 (0.75-1.45)
40 or more	1.79 (1.44-2.23) *	1.58 (1.09-2.28) *
Residence		
Urban	1.00	1.00
Rural	0.52 (0.46-0.57) *	0.50 (0.42-0.61) *
Continuity of care		
Low (UPC ≤ 0.69) [1]	1.00	1.00
High (UPC > 0.69) [1]	0.38 (0.33-0.43) *	0.24 (0.19-0.29) *

* P ≤ 0.05

† Characteristics were not significant in the initial model and were removed in the final model

[1] Where UPC stands for Usual Provider of Care

BIOGRAPHIES

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Master of Science, Statistics, University of Alberta

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Research Associate, Department of Mathematical Sciences, University of Alberta. Currently involved in health services research using administrative files maintained by Alberta Health and Wellness. Also currently doing some outcomes research related to hip fractures in older adults.

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Dr. Bell's research interests include health economics, drug utilization, and translation of research findings into clinical practice. Research areas include understanding and improving the care of patients with asthma and musculoskeletal disorders in community settings. Dr. Bell has received research funding from AHFMR, NHRDP and the Institute of Health Economics.

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